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Quicksilver Deposits In Nevada

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HISTORY AND PRODUCTION

The first discovery of cinnabar in Nevada was possibly made by Indians, for in the vicinity of Ione they are reported by early settlers to have used the bright red mineral for body paint. The first discovery of quicksilver minerals by white men will probably never be definitely known. The earliest reference the writers have been able to find is the designation of a locality as "Quicksilver" on Degroot's Map of Nevada Territory published in 1863; this place is fairly near the present Mt. Tobin and Goldbanks quicksilver mines. Four years later native mercury was reported³ as having been found "near the center of the State."

In 1875 cinnabar was recognized near the center of the State in the Belmont district and south of Reno at the Wheeler ranch and Steamboat Springs localities.⁴ These discoveries resulted in the staking of many claims, and at the Steamboat Springs mine a small but unrecorded amount of quicksilver was recovered in the late 1870's. Between 1875 and 1900 cinnabar was doubtless found in several placer-gold deposits, but no lodes were developed until 1906, when deposits in the Humboldt Range and near Goldfield were discovered.

It is somewhat surprising that quicksilver mines in Nevada were not developed earlier, for during the period from 1865 to 1895 a tremendous amount of quicksilver was brought in and used in amalgamating the gold-silver ores of the Comstock Lode. The exact amount of quicksilver used is unknown, but must have been at least 200,000 flasks, or at least four times the amount as yet recovered from all Nevada quicksilver mines.

The real birth of the quicksilver industry in Nevada might be said to be in 1907, for in this year the productive deposits of the Nevada Cinnabar (Shoshone) and Mercury Mining Company mines near Ione were discovered. Together, these two mines yielded nearly 10,000 flasks of quicksilver by the end of 1919, and their productivity doubtless stimulated prospecting for quicksilver. New deposits were found and mined prior to and during the first World War in the Goldbanks, Pilot Mountains, Imlay, and Antelope Springs districts, but the State production steadily

³Stretch, Richard H., Annual Report of the State Mineralogist of Nevada for 1866.

⁴Whitehall, H. R., Sixth Biennial Report of the State Mineralogist of Nevada for 1875 and 1876.

declined from 2,500 flasks in 1912 to only a few hundred flasks in 1920. From 1920 to 1927 little quicksilver was recovered.

In 1927 the price of quicksilver rose to more than \$100 a flask, and production from the Pershing and Juniper (Nevada Quicksilver) mines in the Antelope Springs district, the B. & B. and Red Rock mines in the Fish Lake Valley district, and the Castle Peak mine in the Castle Peak district resulted in a new high of nearly 5,000 flasks being recovered in 1929. In 1932, however, the price decreased to only \$50 a flask, and at the same time, partly because of the exhaustion of several of the known ore bodies, the yearly production decreased to only 500 flasks.

Between 1932 and 1939 a few good deposits were discovered but, because of the prevalent low price of quicksilver, they remained little developed even in 1939 when the price had risen to \$150 per flask. In the following year, 1940, many of the new mines, particularly those in the Bottle Creek district, yielded so much quicksilver that production increased from less than 800 flasks in the previous year to a new high of nearly 6,000 flasks. Since 1940 the known ore bodies in the Bottle Creek district and in several mines elsewhere have been exhausted, but, owing to the opening of the Cordero mine in the Opalite district and the mines in the Ivanhoe district as well as the reopening of the Pershing and Red Bird mines in the Antelope Springs district, output remained high through 1943.

Early in 1944 the price of quicksilver again declined to about \$130 a flask and almost all of the larger mines ceased development work, and probably will treat only readily available ore. The largest producer, the Cordero mine, has developed considerable ore and is expected to continue production for several years.

QUICKSILVER METAL AND MINERALS

QUICKSILVER METAL

Quicksilver* is a very rare element in the crust of the earth where it is estimated⁵ to be only slightly more abundant than silver and gold. Despite its scarcity it commands a relatively low price, for even the exceptionally high value of quicksilver in 1943 amounted to only about \$5,000 a ton, whereas the value of a ton of silver was about \$25,000, and a ton of gold about \$1,000,000.

As compared to the "precious" metals, quicksilver is overwhelmingly more useful to man, and nearly everyone has occasion to use some quicksilver each year either in mercury thermometers, or in amalgam dental fillings, or in such medicines and disinfectants as calomel or corrosive sublimate.

In many of its uses only small amounts of mercury are required, but a few, such as its use in a mercury boiler and turbine, require large amounts in a single installation. Because mercury is a very heavy liquid at ordinary temperatures it is used in thermometers, for floating the lens systems of lighthouses, and in electrical switches and instruments. Because it readily amalgamates with other metals it is widely used in the recovery of gold and silver. Combined with chlorine and oxygen, and even in the metallic state, large amounts of mercury are used for drugs and chemicals. The oxide is widely used in antifouling paint on ship-bottoms, whereas the sulfide is used as a vermilion paint pigment.

Little or no mercury is recovered from most of these uses; hence, it is a constantly diminishing asset which becomes of increasing importance in wartime when it is widely used in drugs and disinfectants, as mercury fulminate in detonators, and as a catalyst in the manufacture of gasses for chemical warfare.

QUICKSILVER MINERALS

Quicksilver occurs in a small number of minerals, and only the red sulfide, cinnabar, is moderately common. Virtually all of the quicksilver production of the world has been derived from

*The element mercury is popularly called "quicksilver" by virtually all men in the mining industry; after it reaches the market it is called "mercury" by chemists, technicians, and others.

⁵Clarks, F. W., and Washington, H. S., The composition of the earth's crust: U. S. Geol. Survey Prof. Paper 127, pp. 21 and 26, 1924.

cinnabar, but in places others of the more than 25 known quicksilver minerals increase the value of cinnabar ore. Exceptionally, a quicksilver mineral other than cinnabar is the principal ore mineral in an unusual quicksilver ore body. The quicksilver minerals that are commonly associated with cinnabar ores, or that are the only valuable constituent of quicksilver ores in a few places, will be described below, along with cinnabar, as it is possible that in the future some of them may become of commercial importance in Nevada.

Cinnabar. Cinnabar, the red mercuric sulfide (HgS), contains by weight about 86 percent of quicksilver. In large masses it is bright red or deep purple in color, but if pulverulent or finely disseminated through a rock it may appear vermilion or carmine. In outcrop, where its surface is tarnished by sunlight, it may become brownish red, or, where finely divided as in opalite ore, bluish grey to black. These discolorations, however, are never more than skin deep, and fresh surfaces invariably show the true red color of the mineral. Cinnabar has a relatively high specific gravity (8.1); it is heavier than pyrite or magnetite, but not as heavy as gold or silver. It is easily panned if it can be freed from light gangue, but in opalite ore the cinnabar crystals are generally so minute that they cannot be freed from silica even with fine grinding. Cinnabar is hexagonal in crystal form, belonging to the same crystallographic system and class as quartz, but well-formed crystals of appreciable size are so rare as to be prized as mineral specimens.

Metacinnabar. Metacinnabar, a black mercuric sulfide with the same composition and content of quicksilver as cinnabar, is a rare mineral, found in Nevada in only a few deposits. In some of the mines in the Belmont district, however, it is as abundant as cinnabar. Dark-colored cinnabar is often reported to be metacinnabar, but the two minerals may be easily distinguished, for metacinnabar gives a black powder or streak, whereas cinnabar gives a red powder or streak. In most places metacinnabar is found as small grains or crystals that are enveloped by cinnabar. Black grains so coated may be suspected of being metacinnabar, but as metacinnabar so closely resembles several other black minerals its identity should be confirmed by chemical test.

Native mercury. Native mercury is a silvery liquid which usually occurs as droplets or globules on cinnabar, but locally, as at the Red Bird mine, it is so finely divided as to resemble soot. It is even heavier than cinnabar (sp. gr. 13.6) and will collect as small globules in the bottom of a pan. Its presence in

cinnabar ore increases the tenor of the ore, but, if present in large amounts, increases the danger of salivation (mercury poisoning).

Chloride and oxychlorides. The chloride and oxychlorides of mercury have been found in small amounts in several Nevada quicksilver deposits. Calomel (Hg_2Cl_2) is a soft, waxy, yellowish-white to pale-green mineral which generally forms small but brilliant crystals. Terlinguaite (Hg_2ClO) and eglestonite ($\text{Hg}_4\text{Cl}_2\text{O}$) are both soft, heavy, bright-yellow minerals which rapidly darken on exposure to sunlight.

Tiemannite. Tiemannite is a mercuric selenide (HgSe) with metallic luster, and steel-gray to lead-gray color; it is soft and about as heavy as cinnabar. It is a very rare mineral and has not been recognized in any Nevada deposits, although near Marysville, Utah, it occurred in sufficient abundance to form a small quicksilver ore body.

Livingstonite. Livingstonite is a mercury-antimony sulfide ($\text{HgS} \cdot 2\text{Sb}_2\text{S}_3$) which resembles stibnite but has a red-brown streak. Its specific gravity is less than that of most mercury minerals, and is also less than that of pyrite or magnetite. It occurs in commercial amounts in Mexico, and because of its similarity to stibnite may be easily overlooked. The high percentage of antimony causes considerable metallurgical difficulty which may be offset by the recovery of the antimony.

Mercurial tetrahedrite. Some varieties of tetrahedrite, more familiarly known as gray copper ore, contain as much as 17 percent quicksilver. At present none of the deposits in which mercurial tetrahedrite is the only ore mineral is commercial.

Mercurial bindheimite. Bindheimite, the bright yellow lead-antimony oxide, was mined as quicksilver ore at the Red Bird mine in the Antelope Springs district and was a prominent constituent of the ore of the Drew mine in the Pilot Mountains district. In both of these localities some cinnabar occurs with the ore, but analyses of the Red Bird ore made by J. J. Fahey of the Geological Survey indicate the bindheimite itself is probably mercurial.

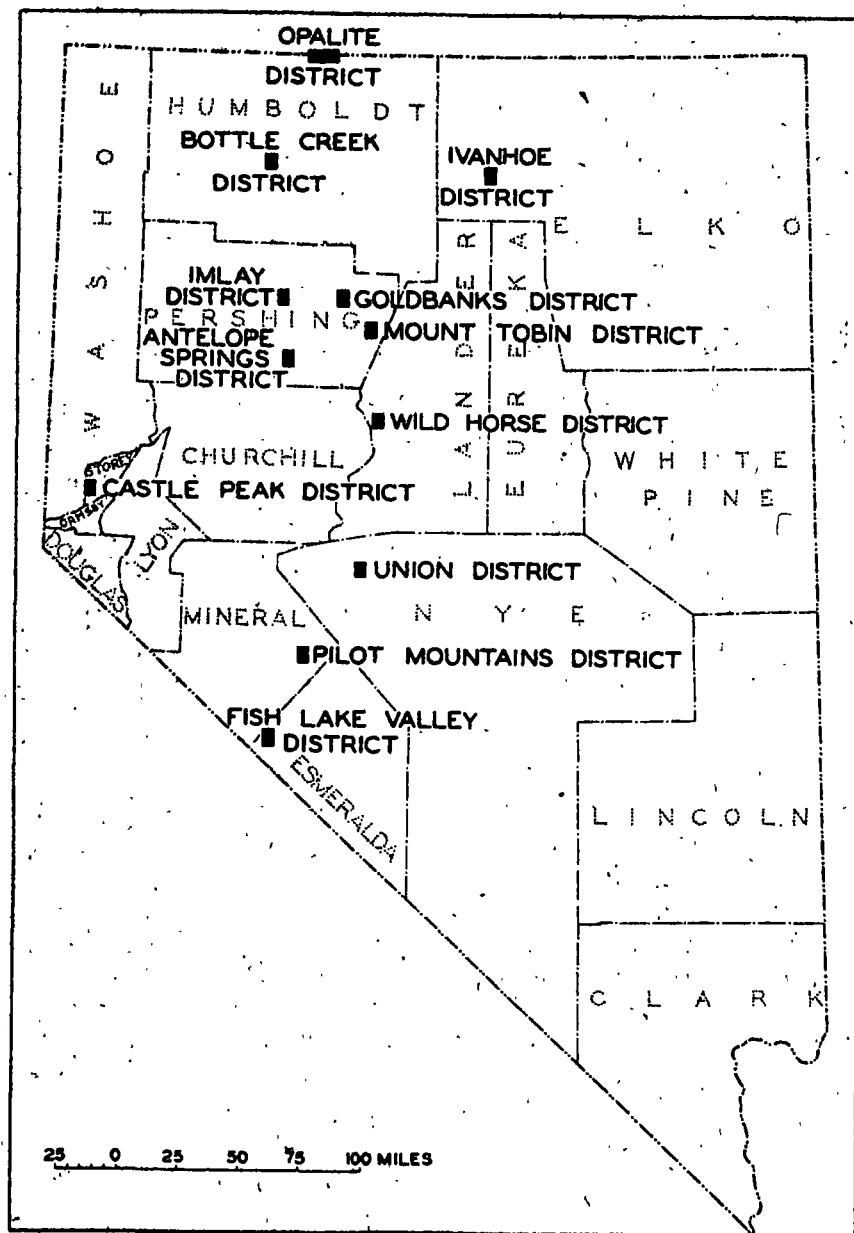


FIGURE 1. Index Map of Nevada Showing Locations of the More Productive Quicksilver Districts.

QUICKSILVER DEPOSITS

ORIGIN

Quicksilver deposits normally contain cinnabar, a mineral which is easily made in the laboratory and for which the conditions necessary for solution and deposition have been repeatedly investigated.^{6 7 8 9} These laboratory investigations, as well as independent field studies, have lead geologists to believe that quicksilver deposits are generally formed from ascending alkaline solutions which, although hot (100°–200° C.), are cooler than most magmatic solutions that have given rise to ore bodies.

Because the mercury-bearing solutions are ascending, ore bodies must overlie a channelway that allows the upward migration of the solutions; generally the channelway is a fault or breccia zone, but some ore bodies overlie essentially unbroken porous rocks through which the rising solutions migrated without benefit of well-defined passageways.

Because the mercury-bearing solutions are believed to be alkaline, certain other minerals soluble in alkaline solutions may be expected to occur in, or in some cases to be removed from, the sites of quicksilver ore bodies. Alkaline solutions readily dissolve silica, arsenic sulfide, and antimony sulfide; they also dissolve smaller amounts of gold and the sulfides of iron, zinc, and copper. The general occurrence of silica, antimony, and iron minerals in some types of quicksilver deposits is well known, and small quantities of gold, arsenic, zinc, and copper minerals occur in some Nevada quicksilver ores.

Because the mercury-bearing solutions are relatively cool, ore bodies may be expected to have formed near the surface. The depth of formation of most quicksilver ore bodies in Nevada has not been determined, but, as was pointed out by Becker,¹⁰ cinnabar is contained in sinter deposited essentially at the surface at

⁶Becker, G. F., Quicksilver deposits of the Pacific slope: U. S. Geol. Survey Mon. 13, pp. 419–437, 1888.

⁷Allen, E. T., and Crenshaw, J. L., The sulfides of zinc, cadmium, and mercury; their crystalline form and genetic conditions: Amer. Jour. Sci., 4th ser., vol. 34, pp. 341–396, 1912.

⁸Broderick, T. M., Some experiments bearing on the secondary enrichment of mercury deposits: Econ. Geol., vol. 11, pp. 645–651, 1916.

⁹Dreyer, Robert M., Geochemistry of quicksilver mineralization: Econ. Geol., vol. 35, pp. 17–48 and 140–157, 1940.

¹⁰Becker, G. F., *op. cit.*, pp. 343–346.

Steamboat Springs. In contrast, appreciable amounts of cinnabar were found at a depth of 1,200 feet at the White Caps gold mine in the Manhattan district. Probably most of the quicksilver deposits in Nevada were formed at depths between these limits; certainly several were formed at depths of only a few hundred feet.

DISTRIBUTION

Geographically, most of the quicksilver deposits in Nevada lie in a northerly trending belt extending through the State from Beatty in the south to McDermitt in the north. (See Plate 1.) The limits of the belt are most easily remembered by visualizing Nevada as divided into thirds by north-south lines; the eastern line would be about half way between Battle Mountain and Elko in the north and would pass east of Beatty in the south, whereas the western line would pass close to Lovelock and Mina. The central third contains most of the quicksilver deposits, and, further, those mines now most productive lie in the northern half of this belt.

Geologically the quicksilver deposits are less confined than they are geographically, for they occur in rocks of nearly all kinds and ages. Generally those rocks that are locally the most brittle are the most favorable sites for quicksilver deposition, but there are so many exceptions to this generalization that it is of little value in prospecting. Rocks that are relatively impervious, such as shales, do not allow the ore-forming solutions ready access and consequently rarely contain quicksilver ore bodies. Other formations that cover large areas and contain no known ore bodies include the alluvium and lake deposits in the broad valleys and the extensive, very young, flows of basalt.

The structures along which most ore bodies have been found are faults of small displacement. The faults of large displacement responsible for the uplift of the basin ranges, so far as is now known, only very locally contain small amounts of cinnabar, but many fractures and crushed zones, along which there can have been at most only a few inches to a few feet of movement, contain mineable quicksilver ore. As will be further emphasized in the "Suggestions for Prospecting," areas containing many hot springs are not particularly favorable places for quicksilver deposition, and no appreciable amounts of quicksilver have been recovered from the proximity of hot springs in Nevada.

LOCALIZATION

Only under certain favorable conditions and only in favorable places are quicksilver minerals deposited in sufficient abundance to form ore bodies. The factors that control this localization of ore bodies are both physico-chemical and structural. The physico-chemical conditions that affect the rising solutions and cause the deposition of cinnabar are not easily studied or well understood, but they doubtless include acidification, dilution, chemical reaction with the wall rock, and the lowering of temperature and pressure. It is fortunate, however, that geologic structures appear to be of greater importance in controlling the localization of the ore, for the structures can be mapped, studied in detail, and followed in mining and prospecting for ore. The kinds of structures that localize ore bodies differ according to the kinds of rocks that enclose the ore bodies, and they are more fully treated in the discussion of the various geologic types of deposits. "Structural traps" and "cap rocks," as emphasized by Schuette,¹¹ appear to localize some types of ore bodies, but they are strikingly absent from others.

¹¹Schuette, C. N.; Occurrence of quicksilver ore bodies: A. I. M. E. Tech. Pub. 835, pp. 5-88, 1930.

STOREY COUNTY

Storey County contains a single quite productive mine and several small quicksilver prospects. Virtually all of the quicksilver produced in the county has come from the Castle Peak mine in the Castle Peak district ten miles north of Virginia City. This mine yielded 2,576 flasks of quicksilver, most of which was recovered during 1929-1934. In 1943 the deposits in the county were not being worked.

CASTLE PEAK DISTRICT

The Castle Peak district is about ten miles north of Virginia City in the Flowery Mountain Range. Cinnabar, the most important mineral mined in the district, was discovered in 1927 at the site of the Castle Peak mine. Over 2,500 flasks of quicksilver have been recovered from this deposit, but when the district was last visited late in 1943 the Castle Peak mine and the nearby Washington Hill prospect were idle.

The rocks in the district include pre-Tertiary sediments, Tertiary andesitic volcanic rocks, and late Tertiary or Pleistocene basalt which forms broad mesas and flat-topped ridges. The largest deposits of cinnabar are of the volcanic type and occur in the altered facies of the volcanic rocks, but a small amount of cinnabar has been found disseminated in opalite.

CASTLE PEAK MINE

Location.....Sec. 20, T. 18 N., R. 21 E.
Ownership.....R. Nenzel of Babbit, Nevada.
Discovery.....1927 by H. E. Lufek.
Production.....2,576 flasks to the end of 1943.
Geologic type.....Volcanic.

The Castle Peak mine lies at an elevation of about 5,800 feet on the west fork of Lousetown Creek in the Paradise Range. The deposit was discovered by Hank Lufek in 1927, and in the following year he did development that lead to the blocking out of considerable ore. By September 1929 he had organized the Castle Peak Quicksilver Company and installed a 30-ton rotary furnace. By the end of the year 461 flasks of quicksilver had been recovered from 3,641 tons of ore, averaging 9.6 pounds of quicksilver to the ton. During the following two years 1,480 flasks were recovered from ore mined from above the haulage level. In 1931 and 1932 somewhat richer ore encountered below the haulage level yielded 865 flasks. During 1933, 1934, and 1935 considerable development was done on the lower levels, and ore averaging

about six pounds of quicksilver to the ton yielded 407 flasks. In 1937 the property was leased to Brechtel and Hann, and in 1938 to the Moro Bay Copper Company, but neither of these lessees produced. In 1939 it was leased to the American Quicksilver Company which recovered 66 flasks. Since 1939 the property has been leased to several individuals who produced only small amounts of quicksilver, and in 1943 the furnace was removed. The total production from the mine has been 2,576 flasks of quicksilver recovered from about 23,500 tons of ore averaging 8.7 pounds of quicksilver to the ton.

The underground workings consist of over 3,000 feet of drifts and crosscuts and small stopes on three main levels and several sublevels. Surface workings consist of a glory hole which measures about 100 feet by 60 feet by 35 feet, several small trenches, and three shafts about 45 feet deep. (See Plate 23.)

The rocks of the area consist of pre-Tertiary limy shales, Tertiary undifferentiated volcanic rocks and gray hornblende andesite, and a late Tertiary or Pleistocene flow of olivine basalt.

The pre-Tertiary sediments which strike northerly and stand nearly vertical crop out only in the area to the south of the mine.

The oldest Tertiary rocks are undifferentiated volcanics that include hornblende andesite, andesite agglomerate, olivine basalt, and rhyolite. The hornblende andesite and the agglomerate have been extensively argillized and locally alunitized. Lenticular bodies of olivine basalt interbedded with the altered andesitic rocks are remarkably free from alteration. Rhyolite is not abundant, but one small outcrop lies just north of the furnace. Unaltered gray andesite porphyry overlies the afore-mentioned rocks and apparently is not penetrated by the underground workings.

The only fault of economic importance is the northerly trending fault explored by drifts and the main inclined winze. No offset along this fault could be measured, but the displacement is believed to be small. Near the surface two sets of intersecting joints which trend N. 55° W. and N. 65° E. through the altered volcanic rocks were of importance in localizing ore minerals. These mineralized joints have been followed by the glory hole, the connecting or "dome" stope, the main haulage level, and a stope below the main haulage level.

The principal ore mineral is cinnabar, but considerable native mercury, and less calomel, contribute to the value of the ore. Gangue minerals include clays, barite, several carbonates, pyrite, and possibly marcasite, and gypsum.

Crystalline cinnabar fills fractures as veinlets and fills small

openings due to leaching of the volcanic rocks; the wider cinnabar veinlets in many places contain crystal-lined vugs which locally contain native mercury. In some specimens cinnabar clearly replaces selectively the clay-like alteration products of hornblende and plagioclase phenocrysts, and in some fine breccias it replaces selectively some of the smaller angular fragments. However, most of the cinnabar not in distinct veinlets is disseminated as very small crystals or crystalline aggregates through the altered rock. It seems probable that this cinnabar began to form in minute openings, but increased its size by replacing the surrounding rock.

The ore bodies may be classified on the basis of occurrence into two kinds. One kind includes the ore bodies of greatest value mined in the glory hole, connecting "dome" stope, and a stope immediately below the haulage level. They were localized along two sets of nearly vertical nonpersistent joints intersecting at angles of 60-80 degrees. The joint intersections seem to have been the most favorable loci for ore deposition, but cinnabar also occurred in mineable quantities along individual joints, and locally was disseminated for several feet into the wall rocks. As the ore bodies follow the joint planes they are in part tabular, but at joint intersections they are more pipe-like. The rock mined in the glory hole and upper stopes probably contained sufficient cinnabar disseminated away from the joints so that it all was furnace ore.

The ore bodies of the second kind were of lesser value and were mined from the levels below the haulage level. They were localized by the northerly trending fault which dips 55° to the east, but lenses of ore lay not only in the fault gouge but also in places beneath the gouge and elsewhere along parallel faults in the hanging wall. In contrast to the disseminated type of ore in the upper workings, this ore occurred as small rich pods and veins with sharply defined walls.

Rarely have character changes with increasing depth in quicksilver ore bodies been noted; however, some changes are conspicuous within a vertical interval of 250 feet at the Castle Peak mine. These changes in going from surface to depth consist of an increase in the amount of silicification, native mercury, pyrite, calcite, barite, ankerite, and dolomite (?), and a decrease in rock alteration, and the amount of gypsum, calomel, and disseminated cinnabar.

WASHINGTON HILL PROSPECT

Location.....Sec. 5, T. 18 N., R. 21 E.

Ownership.....Estate of H. E. Lufek of Reno.

Discovery.....1941 (?) by Lufek.

Production.....Very small.

Geologic type.....Volcanic.

The Washington Hill property is in the northern part of the Flowery Mountain Range about three miles north of the Castle Peak quicksilver mine. In 1942 the property was under lease to Dave Livisohn who, in an experimental way, mined ore from an open pit and trucked it to the Southern Comstock Mill at Silver City for concentrating. Although production records are not available, it is safe to assume that no more than a few flasks of quicksilver were recovered.

The workings consist of a small open pit and a 200-foot adit extending directly below the pit. Many shallow bulldozer cuts have been made in the vicinity of the pit and on a hill to the east.

Volcanic rocks and a near-surface intrusive exposed in the area are believed to be of Tertiary age. The oldest of these rocks are fine-grained andesite flows, tuffs, and agglomerates that are cut by the andesitic intrusive; a younger andesite flow unconformably overlies these older rocks. Silicified rocks of two types were formed from the pyroclastics; their differences are believed to be due to differences in the original rocks. One type, a red to purple silicified agglomerate, consists mostly of chalcedony and crops out as prominent lenticular ribs which strike northwesterly. The second type, a white to brown opalite, is in most places confined to the base of the youngest andesite flow.

The rocks are mildly folded and faulted, but the most significant structural feature is the apparent conformity of the silicified ridges and the ore-bearing faults seen in the excavations. The conformity suggests the ore bodies and the generally barren opalite pods were both deposited along northerly trending fractures but not contemporaneously.

Cinnabar occurs as minute disseminated crystals and as small irregular veinlets in altered tuff and agglomerate. A large fractured area in the open cut contains a slight local concentration of cinnabar, and scattered crystals of cinnabar were observed in a resin-colored opalite exposed in the bottom of the open cut. Probably all of the ore mined in the past was of submarginal grade.

UNNAMED DISTRICT

TAYLOR-BRANCH PROSPECT

Location.....Sec. 35, T. 20 N., R. 22 E.

Ownership.....Unknown.

Discovery.....1931 by Clyde Taylor and Fred Branch.

Production.....Very small. *

Geologic type.....Volcanic.

The Taylor-Branch prospect lies one mile south of Clark Station, a station on the Southern Pacific railroad in Truckee Canyon, about 36 miles east of Reno. The property was discovered in 1931 by Fred Branch and Clyde Taylor who did little development work until 1940-1941 when they installed a 2-pipe retort and recovered a small amount of quicksilver.

The underground workings consist of a 54-foot inclined shaft and 200 feet of northeasterly trending drifts on the 32-foot level. The surface above the workings has been explored by several open cuts and pits.

The rocks in the area are argillized and locally silicified andesite tuff and breccia overlain by younger unaltered flows of andesite. Cinnabar occurs as scattered crystals in the tuff and fills incipient fractures in the silicified rock. Pyrite occurs as veinlets in scattered chalcedony nodules in the breccia; gypsum and jarosite are fairly abundant in the surface workings.

WASHOE COUNTY

In Washoe County cinnabar has been discovered in small amounts from the southern edge of the county at Steamboat Springs to the northern edge on the Sheldon National Game Refuge. Quicksilver was first mined in Nevada from the Steamboat Springs deposit in the late 1870's, but because of the low grade of the ore repeated efforts to mine the deposit have been unsuccessful. The total production of the county is not definitely known, but it is probably only about 100 flasks of quicksilver.

LONE PINE DISTRICT

The Lone Pine district is in northwestern Washoe County in the southern part of the Sheldon National Game Refuge. Early prospecting for gold disclosed very little of that metal, but the more recent discovery of cinnabar led to the location of a block of 18 claims by Curtes Mathews and W. A. Miller in December 1929.

The geology and ore deposits are discussed in a recent bulletin by Ross.⁶⁵ Briefly, the rocks in the district consist of andesitic lava flows and associated tuffs that appear to belong to two lithologic units, both of which are probably of Tertiary age. The only quicksilver deposit is of the volcanic type, as the cinnabar occurs along steep fractures in argillized and iron-stained andesite. When the district was last visited in 1942 inadequate exploratory work had failed to develop other than submarginal ore bodies.

ANTELOPE PROSPECT

Location.....Center of T. 45 N., R. 21 E.

Ownership.....W. A. Miller and Curtes Mathews.

Discovery.....1929 by Mathews and Miller.

Production.....Very small.

Geologic type.....Volcanic.

The Antelope prospect consists of a group of 18 patented claims lying on the top of a block-faulted plateau at an altitude of 6,700 feet. The workings are within the confines of the Sheldon National Game Refuge about six miles south of the refuge headquarters. From the time of the discovery of the property until 1939 little exploratory work was done, but in 1939 the Colton Log and Lumber Company took a bond on the property, did some development work, and reportedly produced a small amount of

⁶⁵Ross, C. P., Some quicksilver prospects in adjacent parts of Nevada, California, and Oregon: U. S. Geol. Survey Bull. 931-B, pp. 24, 25, 1941.